Factors Affecting Postoperative Morbidity and Mortality in Obstructing Colorectal Cancer

Tıkayıcı Kolorektal Kanserde Postoperatif Morbidite ve Mortaliteyi Etkileyen Faktörler

Obstructing Colorectal Cancer

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Özet

Amaç: Amacımız kolorektal kansere bağlı akut barsak tıkanıklığı nedeniyle acil ameliyat edilen hastalarda postoperatif morbidite ve mortaliteye etki eden faktörleri araştırmaktır. Gereç ve Yöntem: Perforasyonsuz tıkayıcı kolorektal kanser nedeniyle ameliyat edilen 43 hasta retrospektif olarak değerlendirildi. Postoperatif morbidite ve mortaliteyi etkileyen ana prognostik faktörleri belirlemek için lojistik regresyon analizi kullanıldı. Bulgular: Postoperatif dönemde 8 (%18.6) hastada mortalite görülür iken, 16 (%37.6) hastada postoperatif morbidite gelişti. Tek değişkenli analizde, 65 üzeri yaşın (p=0.034), eşlik eden sistemik hastalığın (p=0.035), ileri tümör evresinin (p=0.040) ve yüksek ASA skorunun (p=0.000) postoperatif morbidite gelişimi ile ilişkili olduğu bulundu. Öte yandan, 65 üzeri yaş (p=0.023), eşlik eden sistemik hastalık (p=0.014), yüksek ASA skoru (p=0.010) ve uzak metastaz varlığı (p=0.012) postoperatif mortalite ile ilgili risk faktörleri olarak tanımlandı. Lojistik regresyon analizi sonrası, yüksek ASA skoru (p=0.005) ve uzak metastaz varlığı (p=0.000), postoperatif mortalitenin bağımsız prognostik faktörleri olarak saptanırken, 65 yaş üzeri yaş (p=0.023) ve yüksek ASA skoru (p=0.000) postoperatif morbiditenin prognostik faktörler olarak belirlendi. Tartışma: İleri yaş ve eşlik eden sistemik hastalık varlığı tıkayıcı kolorektal kanser için acil ameliyat edilen hastalarda postoperatif morbidite ve mortaliteyi artırır. ASA skoru, hem morbidite hem de mortalite için güçlü bir prognostik faktör olarak, preoperatif risk sınıflandırması ve cerrahi planlamada kolaylıkla kullanılabilir.

Anahtar Kelimeler

Kolorektal Kanser; Barsak Tıkanıklığı; Morbidite; Mortalite

Abstract

Aim: Our aim is to investigate the factors affecting on postoperative morbidity and mortality in patients who underwent emergency surgery for acute intestinal obstruction due to colorectal cancer. Material and Method: Forty-three patients who was operated because of acute obstructing colorectal cancer without perforation were retrospectively evaluated. Logistic regression analysis was used to identify the main prognostic factors affecting postoperative morbidity and mortality. Results: Postoperative morbidity was developed in 16 (37.6%) patients while mortality was seen in 8 (18.6%) patients during the postoperative period. In univariate analysis, age above 65 years (p=0.034), accompanying systemic disease (p=0.035), advanced tumor stage (p=0.040), and high ASA score (p=0.000) were found to be associated with the development of postoperative morbidity. On the other hand, age above 65 years (p=0.023), accompanying systemic disease (p=0.014), high ASA score (p=0.010), and presence of distant metastasis (p=0.012) were identified as the risk factors related to postoperative mortality. After logistic regression analysis, age above 65 years (p=0.023) and high ASA score (p=0.000) were determined as the prognostic factors of postoperative morbidity, while high ASA score (p=0.005) and presence of distant metastasis (p=0.000) were found to be the independent prognostic factors of postoperative mortality. Discussion: Older age and the presence of accompanying systemic diseases increase the postoperative morbidity and mortality in patients who underwent emergency surgery for obstructing colorectal cancer. ASA score, as a strong prognostic factor for both morbidity and mortality, can be easily used in preoperative risk stratification and surgical planning.

Keywords

Colorectal Cancer; Intestinal Obstruction; Morbidity; Mortality

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Introduction

Acute intestinal obstruction (AIO) is one of the leading causes of emergent surgical interventions worldwide, of which colonic causes represent approximately 20%. Colorectal cancer (CRC) is among the most diagnosed and lethal malignancies in both men and women, and consists 85% of all these colonic obstructions [1]. In patients with acute mechanical obstruction due to CRC, emergency surgery is associated with significantly increased postoperative morbidity and mortality when compared with the elective ones [2-5]. It is well known that these cancers are more common in older age population that have more co-existing diseases than youngers. In addition, the patients with acute malignant colonic obstruction usually present at advanced stages of tumor. Insufficient preoperative evaluation and ineffective mechanical bowel preparation also contribute to the worse surgical outcomes in such patients.

In this paper, we aimed to identify the factors affecting on the postoperative morbidity and mortality in patients with AIO due to CRC.

Material and Method

Patients, inclusion and exclusion criteria

The data of 43 patients who underwent emergency surgery for obstructing CRC in a tertiary reference hospital were analyzed in this retrospective study. Data were collected from the clinic and operation records of the patients. Patients under 18 years and patients with accompanying intestinal perforation were excluded from the study.

Perioperative evaluation of the patients

All patients presented to emergency room with signs of AIO such as abdominal pain, distension, nausea, vomiting, and obstipation. Diagnosis of AIO was based on the clinical findings and various radiological methods including plain abdominal radiography (air-fluid levels), ultrasonography and, in a proportion of cases, computed tomography (CT) scan of the abdomen. Routine laboratory tests, chest x-ray and electrocardiogram were also the main parts of the preoperative evaluation. After sufficient fluid resuscitation, proper parenteral antibiotic prophylaxis (third-generation cephalosporins plus metronidazole), urinary catheterization and placement of the nasogastric tube, the patients were immediately taken to the operating room within 48 hours after admission. All operations were performed by the same surgeon team. Diagnosis of obstructive colorectal adenocarcinoma was established postoperatively based on histopathological reports evaluated by the same pathologist team.

Dependent and independent variables

The postoperative morbidity and mortality were the primary endpoints. The term, "Postoperative morbidity", was used for the complications that prolonged the hospital stay and required additional treatment or intervention to the patients, within one month postoperatively. On the other hand, "postoperative mortality" was defined as the death within the one month after operation. The following independent variables were used to analyze possible associated factors of postoperative morbidity and mortality: age, sex, accompanying systemic diseases, preoperative hemoglobin (Hb) and albumin (alb) levels, ASA score (ASA 1-2: low ASA score, ASA 3-4: high ASA score), localization of the tumor (right colon cancer: proximal to splenic flexure, left colon cancer: distal to splenic flexure), stage (early: stage 1-2, advanced: stage 3-4), operation type (two-step surgery: enterostomy at the initial operation following resection at the second season, resection with or without anastomosis), and presence of distant metastasis.

Statistical evaluation

All data were statistically analyzed by using the statistical package for social sciences (SPSS 21.0 software, IL-Chicago- USA). Results of descriptive analysis were expressed as the mean±SD, number or percentages for variables. Statistical comparative analysis for categorical variables was performed using Chi-square test. Normality distribution of quantitative variables was assessed with Kolmogorov-Smirnov test and with histograms. Comparative analysis of the quantitative variables was performed using Student's t-test or nonparametric Mann-Whitney U test for non-normally distributed variables. Multivariate analysis was performed using the binary logistic regression model for the variables found statistical differences in univariate analysis, and thus prognostic factors on postoperative morbidity and mortality were identified. p value<0.05 was considered statistically significant.

Results

Forty-three patients (22 males, 21 females) who were operated on AIO due to CRC were included in the study. Demographic, clinical and operative data of the patients were presented in Table 1.

Sixteen (37.6%) patients developed at least one complication during the postoperative period of one month. Among those, wound infection was the most common (n=9) complication. Anastomotic leak (n=3), evisceration (n=2), intraabdominal hemorrhage (n=1), and intraabdominal abscess (n=1) were the other causes of postoperative morbidity. The median age of the patients who had postoperative morbidity (68.7 years) was higher than the all patients' median age (63.8%). In addition, 15 of the patients with postoperative morbidity had ASA 3 or 4 scores. In univariate analysis, age above 65 years (p=0.034), accompanying systemic disease (p=0.035), advanced tumor stage (p=0.040), and high ASA score (p=0.000) were found to be associated with the development of postoperative morbidity. However, age above 65 years (p=0.023) and high ASA score (p=0.000) were determined as the prognostic factors after analysis with binary logistic regression test.

Postoperative mortality was seen in eight (18.6%) cases. These patients had a median age of 70, which was higher than the median age of study population. Additionally, all the patients who died within the one month after surgery were graded as ASA 3 or 4. Two-step surgery was the most performed surgical procedure (21, 48.8%) in the patients. Three of these cases died during the postoperative period, while the remaining 18 patients had a second look operation. All the 18 patients had left-sided tumor, and resection plus anastomosis (subtotal colectomy, sigmoid resection, left hemicolectomy or anterior/low anterior resection) was performed, according to the tumor localizations. Age above 65 years (p=0.023), accompany-

Table 1. Demographic, clinical and operative data of the patients (n=43)

Data	Results
Age (mean±SD, range)	mean: 63.8±14.2, range: 28-85 years
Gender	male (22, 51.2%), female (21, 48.8%)
Accompanying systemic disease (n, %)	26 (60.5%)
Preoperative hemoglobin (gr/dl)	
Hb<10 gr/dl	15 (34.8%)
Hb>10 gr/dl	28 (65.2%)
Preoperative albümin (gr/dl)	
Alb<3 g/dl	18 (41.8%)
Alb>3 g/dl	25 (58.2%)
ASA score	
ASA 1-2	17 (39.5%)
ASA 3-4	26 (60.5%)
Localization of the tumor	
Right colon	7 (16.2%)
caecum	2 (4.7%)
ascending colon	2 (4.7%)
transverse colon	3 (7.0%)
Left colon	36 (83.8%)
descending colon	7 (16.3%)
sigmoid colon	19 (44.2%)
rectum	10 (23.3%)
Type of surgery	
Two-step surgery	21 (48.8%)
Resection with or without anastomosis	22 (51.2%)
Tumor stage	
Early stage (1-2)	4 (9.3%)
Advanced stage (3-4)	39 (90.7%)
Presence of distant metastasis	8 (18.6%)

ing systemic disease (p=0.014), high ASA score (p=0.010), and presence of distant metastasis (p=0.012) were the risk factors associated with postoperative mortality in univariate analysis. On the other hand, logistic regression analysis showed that high ASA score (p=0.005), and presence of distant metastasis (p=0.000) were the independent prognostic factors that was related to mortality.

Statistical analysis of all demographic, clinical and operative factors on postoperative morbidity and mortality was presented in Table 2. According to the statistical results, gender, preoperative hemoglobin and albumin levels, tumor localization and type of surgery had no significant effect on both postoperative morbidity and mortality.

Table 2. Statistical analysis of the demographic, clinical and operative factors affecting postoperative morbidity and mortality

Factors	Morbidity (n=16)	Univariate p value	Multivariate p value	Mortality (n=8)	Univariate p value	Multivariate p value
Age		0.034	0.023		0.023	0.560
Age≥65	15/30			6/30		
Age>65	1/13			2/13		
Gender		0.787			1.000	
Male	8/22			4/22		
Female	8/21			4/21		
Accompanying disease		0.035	0.235		0.014	0.145
Present	11/26			6/26		
None	5/17			2/17		
Preop. Hb		0.840			0.757	
Hb<10 gr/dl	6/15			3/15		
Hb>10 gr/dl	10/28			5/28		
Preop. alb		0.936			0.640	
Alb<3 g/dl	7/18			4/18		
Alb>3 g/dl	9/25			4/25		
ASA score		0.000	0.000		0.010	0.005
ASA 1-2	1/17			0/17		
ASA 3-4	15/26			8/26		
Tumor localization		1.000			1.000	
Right colon	2/7			1/7		
Left colon	14/36			7/36		
Type of surgery		0.950			1.000	
Two-step surgery	7/21			3/21		
Resection±anastomosis	9/22			5/22		
Tumor stage		0.040	0.065		0.358	
Early stage (1-2)	1/4			1/4		
Advanced stage (3-4)	15/39			7/39		
Distant metastasis		0.545			0.012	0.000
Peresent	3/8			7/8		
None	13/35			1/35		

Discussion

AIO develops in around 10% of the patients with CRC [6,7]. It is fact that colorectal operations for an emergency condition have a higher risk of postoperative complication than elective surgeries [8]. The morbidity rates related to emergency surgery for obstructing CRC have been reported up to 77% in the literature [8]. In our case series, postoperative morbidity rate was 37.2%, consistent with the previous reports.

Advanced age is an important and well-known factor for development of morbidity and mortality in both elective and emergency surgeries [9]. It is also one of the most affecting factor on the surgical outcomes of the patients who undergone urgent operation due to obstructed CRC [10,11]. Since this cancer is an elderly disease, a significant proportion of the patients have comorbid disorders, functional dependency, and limited life expectancy. For this reason, postoperative complications are more frequently seen in geriatric CRC population than in youngers. In our study, the mean age of the patients included the study was 63.8 years while the cases who developed postoperative morbidity had a mean age of 68.7. In addition, age above 65 years was found to be a prognostic parameter for postoperative morbidity. Besides, 60% of the patients had comorbid disease preoperatively, but this condition was not any significant effect on postoperative morbidity, statistically. Gender was also not found as an affecting factor for postoperative morbidity, in paralel to other studies [4,10].

High ASA score was the other prognostic factor for the development of morbidity in our study population. All patients with ASA4 score and approximately half of the cases with ASA3

score developed morbidity after surgery while only one of 17 patients with ASA1 or 2 score had postoperative complication. There are many studies that show the strong association between the high ASA score and the development of postoperative complication in the literature. In one of those, Alvarez et al reported that the risk of postoperative morbidity increased in patients who had high ASA scores and were applied perioperative blood transfusion [2]. Similarly, Kısaoglu et al showed that ASA3-4 scores were associated with high postoperative morbidity in their patient group, in addition to age above 70 and the presence of accompanying systemic disease [4]. In another study with 230 cases of emergent surgery for obstructing colon carcinoma, analysis revealed that ASA grade ≥3 was one of the most important prognostic factors for poor outcome [12].

Preoperative hemoglobin and albumin values, tumor localization, the type of surgery, tumor stage, and the presence of distant metastasis are also among the reported factors affecting on both postoperative morbidity and mortality of the patients with obstructing CRC. Kısaoglu et al reported that preoperative hemoglobin and albumin levels did not effect postoperative complication rate; however, they found albumin level less than 3 g/dl was a risk factor for postoperative mortality [4]. In a study by Lango et al, hypoalbuminemia together with high ASA score were shown to have significant effect on postoperative mortality [13]. In our study, decreased hemoglobin level and hypoalbuminemia were not found to be risk factors for the development of postoperative complications and death.

The localization of the tumor and the type of the surgery did not also have any significant effect on postoperative morbidity and mortality, similar to other studies [4,10]. It is well known that cancer arising in the distal to splenic flexure is more likely to obstruct than cancer arising in the proximal to splenic flexure, mainly due to the narrow lumen and the firm content of the left colon. Approximately two thirds of the cases with acute mechanical bowel obstruction are seen in the left colon [14]. Accordingly, sigmoid colon and rectum were the most frequently obstructed colonic segments in our case series while only 9% of the patients had right-sided tumor.

The surgical approach to acute obstruction due to CRC is still a problematic issue, and diverted colostomy alone is traditionally thought to be less morbid surgery in comparison to other complicated surgeries such as resection and anastomosis. In fact, tumor localization and the general status of the patient are the most decisive factors for the choice of operation type. Resection plus anastomosis is nearly standart surgical procedure for right-sided tumors. We also performed right hemicolectomy and ileotransversostomy for all patients with obstructing right colon cancer. However, there are two surgical approaches to obstructed left colon cancers, including resection plus anastomosis in one season and two-step surgery [15,16]. In cases of bad patient status, presence of extensive colonic distension or faecal peritonitis, and suspicion regarding the safety of anastomosis, two-step surgery may be the most accurate surgical approach. Our surgical choice was also in this direction, and therefore diverted colostomy with or without resection was the most performed operation in our case series. It should be noted here that our high rate of colostomy was also depended on the fact that our hospital is a tertiary referral center.

The tumors causing acute bowel obstruction generally have more advanced stage than the non-obstructing CRCs [17]. In a study by Saliangas et al, approximately half of the patients operated due to CRC on an elective basis had stage 2 tumor while up to 72% of the CRC cases operated due to emergency condition had stage 3 or 4 tumor [18]. Similarly, almost all the patients in the present study had stage 3 or 4 tumors at the time of diagnosis. Additionally, advanced stage was found to be an affecting factor on postoperative morbidity.

Postoperative mortality rate related to emergent colorectal surgery was reported up to 22% in the literature, which is consistent with our mortality rate of 18.6% [19]. In a large-scale study, various factors including age under 70, absence of synchronous liver metastasis, absence of malnutrition, neurological, vascular, and respiratory diseases, and surgery on elective basis were found to be associated with lower mortality rates in patients operated due to CRC [20]. Biondo et al. showed that postoperative mortality incidence increased in patients with ASA 3-4, who underwent surgery due to malignant colonic obstruction [21]. In another study, high ASA score together with hypoalbuminemia was shown to be a significant factor in the development of mortality [13]. There are also many other studies that showed the association between mortality and older age, preoperative high ASA score and tumor stage [21,22,23]. In accordance, four variables including older age, high ASA score, accompanying systemic disease and presence of distant metastasis were found to be associated with postoperative mortality. Among those, high ASA score and presence of distant metastasis were determined as independent risk factors.

It is fact that the number of cases, especially low mortality number, is the major limitation of this study. However, for our opinion, the findings obtained from the work are critical issues which should be considered in the evaluation of these patients before surgery.

In conclusion, the patients operated on emergency surgery due to obstructing CRC usually have advanced tumor stage. In addition, older age and the presence of accompanying systemic diseases increase the postoperative morbidity and mortality in these patients. Finally, we suggest that preoperative ASA score, as a prognostic factor for both morbidity and mortality, can be used for the preoperative risk stratification and surgical planning in patients who underwent emergency surgery for obstructing CRC.

Competing interests

The authors declare that they have no competing interests.

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